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The Broken Broker System?

Transacting on Agricultural Wholesale Markets in India (Uttarakhand)

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ABSTRACT

There is a vigorous debate on liberalization of the heavily regulated agricultural markets in India. A crucial institutional characteristic is the role of state-regulated brokers in wholesale markets. Relying on data from a unique survey in Uttarakhand, a state in North India, we find that regulations on margins are ineffective, since most brokers charge rates that significantly exceed the regulated ones. We also find that a majority of farmers self-select into long-term relationships with brokers. These relationships allow some of the farmers to interlink credit and insurance markets to the agricultural output market. This interlinkage does not, however, appear to be an instrument for farmer exploitation (since it does not lead to worse inputs, higher interest rates, or lower implicit output prices) but is seemingly an extra service provided by brokers to establish farmer loyalty and thereby ensure future supplies.

Keywords: India, agricultural marketing, brokers, interlinkages

JEL codes: *Q12, Q13, L15*

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1. INTRODUCTION

Since the end of the 1990s, India's economy has grown by impressive numbers. It is generally accepted that this growth was triggered and sustained by a series of gradual steps toward liberalizing India's regulated economy. Despite the observed success of liberalization in promoting growth, the debate on liberalization versus regulation is far from over, in particular when it concerns the more traditional economic sectors in India. One of these is agriculture. Government intervention has been pervasive in agricultural markets in India since its independence in 1947. Until very recently, almost all of India's wholesale markets were in some way regulated (Acharya 2004). Regulations included a variety of rules such as a licensing system for traders and brokers; imposed auctions; required use of government-licensed brokers to sell or buy; established commission rates; mandated charges for weighing, loading, and unloading; and taxation of each transaction. These regulations were imposed decades ago. Their purpose was to improve the efficiency of markets and to ensure remunerative prices for producers as well as affordable prices for consumers because agricultural marketing was then perceived to be badly organized, leading to low prices for the producer, large physical losses, and high marketing costs (Mehta 2006; World Bank 2007; Acharya 2004).

However, the reality is that current markets do not meet these objectives. Recent research on the traditional marketing system in India concludes that agricultural markets are not efficient (Mattoo, Mishra, and Narain 2007; Umali-Deininger and Deininger 2001), lack integration (Palaskas and Harriss-White 1996), are beset by collusion (Banerji and Meenakshi 2004), and are characterized by a high level of wastage (Mattoo, Mishra, and Narain 2007). In response to these failures, in 2003 the central government proposed a set of reforms to liberalize the regulated system. This has sparked an active debate on the vices and virtues of existing market regulations (for example, Shiva 2007; Gopalakrishnan and Sreenivasa 2009). State governments have shown mixed reactions, some undertaking liberalization while others continue the existing regulations.

It is now well known that the impact of liberalization of a highly regulated food system is crucially dependent on the institutional organization of the regulated system, on external conditions, and on the nature of the liberalization process—as is well documented by the very diverse experiences in agricultural liberalization in East Asia, compared with those in Africa, eastern Europe, and the former Soviet Union (see, for example, Rozelle and Swinnen 2004; Swinnen, Vandeplas, and Maertens 2011). It is therefore crucial to have a good understanding of the precise empirical functioning of the regulated systems to assess how (various forms of) liberalization would affect them.

Interestingly, despite the vigorous debate on the pros and cons of market regulations in India, the public debate is informed by surprisingly little recent empirical research on the functioning of these markets and on the effects of the proposed regulations (notable exceptions are Goyal 2010; Banerji and Meenakshi 2004, 2008). This paper aims to contribute to reducing this information gap. We study some key institutional aspects of traditional regulated markets and their effects. In particular, we focus on the central role played by state-regulated commission agents, known as *brokers*: agents who are widely present in Indian markets to assist sellers in finding buyers through organizing auctions. It is mandatory for buyers and sellers of food to work through brokers, whose activities are licensed and whose fees are fixed, all as part of the extensive government regulation of market transactions.

In this paper, we use microeconomic evidence to analyze the functioning of these agents in their regulated environments. Based on primary data from wholesale markets in the northern state of Uttarakhand, we look specifically at the important role of the broker in horticultural market transactions. The contributions of our research are twofold. First, we rely on a unique survey design. We collected data from farmers (the sellers) and retailers (the buyers) who had just completed a transaction on the wholesale market. Through their answers, we are able to piece together information on effective practices of brokers, beyond information they revealed themselves. The results show that regulation of prices and prescribed broker commission rates in these markets are largely ineffective. This is an important finding because there is an active debate in the country, with some people arguing for further regulation of

wholesale markets (for example, Shiva 2007; Gopalakrishnan and Sreenivasa 2009). These proponents assume that the regulations deliver in practice what they claim to deliver in theory.

Second, because we collected information not only on broker practices in agricultural output markets but also on markets for credit and insurance, we are able to link broker activities to services delivered in these interlinked markets. There is a vast literature on interlinking, and it has been argued that such interlinkage often leads to exploitation of farmers (for example, by Crow and Murshid 1994; Basu 1986; and Bell 1988). Consistent with the previous literature on interlinkages (Bell 1988; Basu 1986), we do find that brokers subsidize interest rates on advances, but in contrast with this literature, we do not find that this leads to lower implicit output prices. Brokers thus seem to use these interlinkages to tie the output of the farmers to themselves, and they seem to have enough rents under the existing, regulated market system to pay for the costs of the financial services they provide.

This paper is structured as follows. Section 2 gives background information on the functioning of agricultural markets in India. Section 3 presents our data and methodology. In Section 4, we discuss some descriptive statistics concerning the nature of transactions in these wholesale markets. Section 5 looks into the effects of market regulations. Section 6 studies the role of relationships and market interlinkages. We finish with conclusions and implications in Section 7.

2. WHOLESALE MARKETS, BROKERS AND REGULATIONS IN INDIA

Government intervention in agricultural markets has been pervasive since India's independence in 1947, with the initial objective of improving the efficiency of markets and ensuring remunerative prices for producers as well as affordable prices for consumers (Mehta 2006, 146; World Bank 2007). At that time, agricultural marketing was perceived to be badly organized, leading to low prices for the producer, large physical losses, and high marketing costs. A large number of regulations were therefore put in place, including controls on private storage, transport, processing, exports, imports, credit access, and market infrastructure development, as well as a small-scale reservation policy for selected industrial sectors.

One of the main interventions by the government was to establish a large number of public wholesale market yards for agricultural products and to regulate these market yards through an agricultural produce marketing (APM) act (Acharya 2004).[1] Wholesale markets (*mandis*) numbered 268 at the time of independence. It is estimated that there were around 6,300 wholesale markets in India in 2007 (Chauhan 2008). Agricultural marketing within a particular state is regulated by the local APMAct, but variation exists between the states in terms of the extent to which the act is implemented. If it is implemented, an agricultural produce marketing committee (APMC) is responsible for enforcing the act for each market area. The APMC is empowered to establish markets, control and regulate the admission of traders to the market, charge fees (market, license, and rental fees), issue and renew licenses, and suspend or cancel licenses. It allots shops to agents who meet basic eligibility criteria (based on nationality, solvency, and other not particularly restrictive criteria) upon payment of a (rather small) license fee.[2] Once awarded, licenses can be renewed annually.

The salient feature of a typical (non-amended) APM Act is that all *notified* agricultural commodities grown in the notified area of the market (encompassing its legally defined primary catchment area) are required by law to be sold only in these markets and exclusively through government-licensed traders or brokers, usually through auctions.[3] In other words, in the traditional APM Act, there are no provisions for direct procurement from the farmers' fields, nor for contract farming. There are clear upper bounds on the commission rates brokers are allowed to charge, and brokers must pay taxes to the *mandi* authorities as a contribution to a marketing development fund. This fund is to be used for such purposes as developing infrastructure at the wholesale markets and their notified areas.

Typically, farmers bring their produce to the wholesale market and to the shop of the broker with whom they would like to work. Buyers—mostly retailers—then pick up the produce from there. Transactions take place mostly by means of an open outcry auction, managed by a broker who does not take possession but rather just takes a commission (and is therefore called a *commission agent*).[4] As lots are auctioned, new prices are set. Sub-wholesalers, who buy on the wholesale markets but do not sell to consumers themselves, or (petty) retailers, who do sell directly to consumers, buy produce on these wholesale markets. The latter then distribute these products by pushcarts, in mom-and-pop stores, or at wet markets to urban consumers (see also Minten, Reardon, and Sutradhar 2010).

Under the APMC marketing system, it seems that the bulk of trade in agricultural commodities takes place at the wholesale market, run and operated by the APMC. Although farmers might have the

[1] The wholesale market (*mandi*) premises are known as the *market yard*. This must be distinguished from the *mandi area*, which is the entire territory under the purview of a particular *mandi*. This means, for example, that all the *mandi* tax chargeable on the agricultural output produced in the area must be paid to that particular *mandi*, even if it is not physically traded within its premises.

[2] The procedures for licensing are the following: Every year commission agents pay 250 rupees (INR) for their license, plus INR 1 as a *form fee*. This seems to be a nominal amount. These licenses can be renewed on a yearly (or a five-year) basis and it is very rare that a license is not renewed (but it can be transferred to other family members). There is no restriction on the total number of licenses that can be given out. Every year there are new applications for as well as issues of licenses. So there are seemingly few barriers to entry.

[3] The number of notified commodities varies by state and market location, but in general all major food commodities are included.

[4] Unfortunately, no statistics exist on either the geographic coverage of commission agents or the percentage of crops they handle compared with the trader who takes possession.

option—depending on state regulations and their enforcement—to go through local village traders,[5] Fafchamps, Vargas Hill, and Minten (2008) found that the majority of nonstaple food is sold directly through brokers in the wholesale markets by the rural producers themselves.

It has been acknowledged in the literature that these regulated markets have served farmers well over time by offering an assured market and reducing exploitation by unscrupulous traders (Kahlon and George 1985, 26); that they have successfully become a nodal point in agricultural marketing in India because the majority of marketed produce passes through them (Fafchamps, Vargas Hill, and Minten 2007); and that they have created growth centers that influence employment, industries, and land use in their proximity (Harris 1974). However, the regulated market system has come under increased criticism over the years.

One reason for this criticism is the perception that farmers receive low prices compared with consumer prices (see, for example, Prashant 2010), which may be partly attributable to collusion by brokers, combined with the perceived lack of other sales outlets for small farmers (Goyal 2010). These circumstances basically stem from the fact that the APM Act prohibits farmers from selling outside the market yard. While in theory there is no limit on the number of licenses issued by the APMC, the number of license holders typically greatly exceeds the number of shops available in the market yard. Legally, license holders have equal right to conduct business, but in practice the lack of space for trading often severely curtails their business. Since the number of physical shops is practically fixed and holders rarely return licenses, the advantage enjoyed by license holders who have secured a shop at a given rate is generally only reinforced over time. Invariably, members of the same family conduct business at the same shop, which is passed on from one generation to the next.

A second factor putting pressure on traditional market regulations is the increased demand for food safety and quality, driven by strong income growth and development. Effective quality management requires the establishment of closer relationships between upstream and downstream agents, leading to increased vertical coordination in modern supply chains (Swinnen 2007). Because APMCs have emerged over time as a government-sponsored monopoly on marketing services that prohibits innovations such as contract farming and direct procurement by large corporate bodies (Acharya 2004), in many states closer vertical coordination in agricultural supply chains is ruled out by law.

A third problem is the increased importance of bureaucrats in the management of the APMCs: Although more than half the members of these committees represented the farmers of the market area at the start of the regulated market system, elections have not been held regularly and committees are now often administered by bureaucrats, possibly stifling private-sector investments (Acharya 2004).

Further problematic aspects include the large area served per market yard, barriers to entry for newcomers, and government overreliance on market fees as a source of income (Acharya 2004). Although the APMC collects significant revenues from market fees, the infrastructure in most markets is largely deficient, since revenues are often directed toward other ends by the government (Umali-Deininger and Sur 2007; Fafchamps, Vargas Hill, and Minten 2008). As a result, most wholesale markets are not paved, and there are few grading or cold storage facilities. Sanitation facilities are largely deficient, with few public toilets, inadequate drainage, and little or no coordinated pest control.[6] As can be expected, postharvest losses are rather large in this trading environment.

Given these perceived problems with the existing regulated agricultural market system as well as its eagerness to seize new opportunities for agricultural development, the central government, in consultation with state governments and the private sector, formulated a model amended act, which was circulated to the states in 2003. The model amended act proposed removal of restrictions on farmer direct marketing, opening of market infrastructure development to other agencies (especially the private sector), and establishment of a framework to support contract farming. Indian states have responded differently to this initiative. By early 2007, 11 of the 28 states in India had amended their APM Acts but 14 had not, while 2 had never had the original act in place and 1 (Bihar) had repealed its act (Chauhan 2008).

[5] These village traders may work either independently or for specific brokers in the wholesale markets.

[6] To understand why this is important, see, for example, Shilpi and Umali-Deininger (2008) for empirical evidence on the benefits of market infrastructure for agricultural trading in Tamil Nadu.

3. DATA AND METHODOLOGY

To better understand the activities in traditional regulated wholesale markets for horticultural products, a survey was conducted in Uttarakhand, a state in the north of India.[7] There are 17 wholesale markets in Uttarakhand, of which 16 are regulated under the APM Act and only 1 is nonregulated. While a draft bill on the amendment of the APM Act in the state was in circulation at the time of the survey (and had been for a number of years), it had not yet been voted on by the Uttarakhand Assembly. The survey was conducted in December 2007 in the two major wholesale markets of Uttarakhand, that of Dehradun (Niranganpur) and that of Haldwani (Naveen Mandi Sthal). According to the Ministry of Agriculture (India, Ministry of Agriculture 2004), the main crops arriving at the Dehradun wholesale market are potatoes, green peas, ginger, and litchi. The main crops arriving at the Haldwani wholesale market are potatoes, tomatoes, wheat, and rice. In 2007, the Dehradun market had 13 category A broker shops, 34 shops of category B, 78 of category C, 56 of category D, 10 of category E, and a small number of brokers operating out of tin sheds.[8] The Haldwani market had about 230 shops of categories A, B, and C, and another 20 or so brokers operating out of tin sheds. Brokers pay a low yearly license fee of 250 rupees (INR; around US$6).[9] They also may apply for a five-year license.

Our survey focuses on the vegetables cauliflower and green peas. These were the two vegetables that were in full harvesting season and in plentiful supply at both wholesale markets under consideration during the weeks in which our survey was conducted. They are both produced locally and both crops are characterized by significant seasonality. For instance, *mandi* records for the year preceding the survey show that average prices in the period December–March were only one-third the level of the lean period (June–September). Supplies on wholesale markets show even larger swings over the year. The Indian government does not directly intervene in the procurement or price setting of horticultural crops.

Our preliminary interviews and data collection revealed that there were major discrepancies between transaction information collected directly from brokers and information collected from the agents they interacted with. It became clear that because of existing regulations, brokers had strong incentives to misrepresent information on transactions. Hence, one could not depend on interviews with brokers to be reliable sources of information. It was thus decided to interview farmers and petty retailers (the major buyers at these markets) who had just completed a transaction in the wholesale market and to piece together the functioning of brokers based on farmer and retailer interviews. We did not find incentives for these agents to systematically bias information, in contrast with brokers. Hence, we believe that we obtained a more truthful picture this way.

A total of 480 questionnaires were completed, 240 in Haldwani and 240 in Dehradun. The study was set up so that half of the surveys were conducted with farmers and half with retailers, and so that half of the agents were involved with green peas and half with cauliflower. Farmers and retailers were both randomly selected. Farmers were interviewed at the wholesale market, right after selling their produce, while retailers were interviewed at the major retail markets of the city.[10] Enumerators were explicitly asked to behave in a discrete way so as to avoid being obstructed by suspicious brokers.

The survey contained detailed questions on the demographic background of the interviewees, on the reasons for their choice of marketing channel and broker, and on linkages with the broker used in the last transaction for cauliflower or green peas. Then, information was asked on the last completed

[7] Uttarakhand was established as an independent state as recently as 2000. Uttarakhand's population is estimated at 8,489,000 (Census of India 2001), of which 74 percent lives in rural areas. It is estimated that 90 percent of the population depends on agriculture for its living (India, Research, Reference and Training Division 2010). Major agricultural crops include rice, potatoes, wheat, peas, litchi, apples, green gram (mung beans), and medicinal plants (India, Ministry of Agriculture 2004).

[8] These shop categories are based on size (and correlated with the brokers' sales volume); the yearly shop rent is fixed per category.

[9] All dollar amounts are in U.S. dollars.

[10] This was considered to be the optimal way to get information that would be as reliable as possible from both groups of respondents. Retailers, who would visit the wholesale markets in the morning, were often under time pressure to leave the wholesale markets and start their retail activities. In the afternoon, they typically had more time available.

transaction, including detailed and disaggregated information on prices and costs, observable quality characteristics of the product, quality and quantity assessments by retailers, and costs incurred in the transaction. The survey finished with questions on wholesale market practices in general.

We start with descriptive statistics on the farmers and retailers who participated in the survey (Table 3.1). There is little demographic difference between farmers and retailers. While farmers are slightly older (47 years versus 37 years for retailers), their level of education and household size are similar. About 40 percent of them are members of a disadvantaged group under the Indian system, that is, a scheduled caste, scheduled tribe, or other backward class (SC/ST/OBC). Of the farmers, 29 percent carry a BPL (below the poverty line) card and 65 percent an APL (above the poverty line) card.[11] This compares with 30 percent and 51 percent, respectively, for retailers. On the other hand, while 47 percent of the farmers own a mobile phone, only 25 percent of the retailers have one.

Table 3.1—Descriptive statistics

		Unit	Farmers		Retailers	
			Avg or %	St. Dev.	Avg or %	St. Dev.
Demographics						
Age		years	47.2	10.4	37.3	9.8
Level of education		years	5.3	4.1	4.8	3.4
Household size		number	8.0	3.0	7.0	2.3
Member of SC/ST/OBC		%	37		39	
Wealth						
Has a BPL (below the poverty line) card		%	29		30	
Has an APL (above the poverty line) card		%	65		51	
Owns mobile phone		%	47		25	
Land owned		begha (≈ 1/15 ha)	19.0	23.0		
Owns tractor		%	29			
Owns cattle		%	88			
Product characteristics (cauliflower, green peas)						
Average sales	both products	kg per day			36.2	31.7
	cauliflower	kg per day			28.3	16.1
	green peas	kg per day			44.2	40.3
Average production	both products	tons per season	15.4	18.1		
	cauliflower	tons per season	25.4	18.9		
	green peas	tons per season	5.5	10.0		
Sells other products	both products	% yes			85	
Importance in monetary income	both products	avg %	75.2	23.9	41.3	30.3
Experience with…	both products	years	12.6	10.9	11.6	8.3
Land devoted to…	both products	begha (≈ 1/15 ha)	21.5	23.5		
	cauliflower	begha (≈ 1/15 ha)	23.1	20.8		
	green peas	begha (≈ 1/15 ha)	20.0	25.9		
Marketing behavior						
Distance to wholesale market		km	42.1	34.8	3.5	2.1
Visits to this market		visits last 2 weeks			10.0	3.4
		visits this year	23.5	18.7		
Time spent at the market		hours	3.5	2.2	2.3	1.0
Visits other *mandi*		%	16		2	

Source: Authors' own survey.

Apart from green peas and cauliflower, the majority of farmers and retailers also sell other agricultural products. Of the farmers, 83 percent sold other products over the year; 85 percent of the retailers sold another product over the last two weeks. Nevertheless, the two products under study are of major importance for these agents. They make up 75 percent of the annual monetary income of the

[11] Both BPL and APL cards are distributed to poorer households by the government to allow them cheaper access to basic necessities.

farmers and represent 41 percent of the turnover of the retailers over the last two weeks. The two groups have similar years of experience in dealing with the product under study. As could be expected, farmers and retailers differ in the frequency of their market visits. Retailers visit almost every day while farmers come on average 23 times a year. Few farmers (16 percent) and fewer retailers (2 percent) visit other markets.

4. THE NATURE OF TRANSACTING

We distinguish four operations in an agricultural marketing transaction at the wholesale market: physical handling, quality assessment, quantity assessment, and financial settlement. They are discussed consecutively.

Physical Handling

The farmers face physical handling and transaction costs in the process of selling their produce to the wholesale market. First, farmers transport their produce to the market and bear the costs for this. The large majority of farmers (94 percent) use motorized transport to do so. Little aggregation or pooling takes place at the village level, with 62 percent of the farmers bringing only their own produce when they travel to the market. Except for those farmers who own their own means of transport, transport usually has to be paid for and amounts, on average, to almost 10 percent of the price that is fetched on the wholesale market. Second, farmers face opportunity costs for this physical handling process as well as for assisting at the auction. The average farmer spends almost 2 hours traveling to the market and another 2 hours going back, as well as 3.5 hours at the wholesale market itself.[12] In total, an average farmer reports spending 7.5 hours to conduct an agricultural transaction, which is valued on average at about US$75.

Quality Assessment

A large majority of retailers believe there are quality differences between the different lots of agricultural produce at the wholesale market (Table 4.1). To assess quality, most retailers (85 percent) rely on personal inspection; 10 percent report trusting the broker to offer quality, and the remaining 5 percent claim to have no assurance concerning the quality on offer. In case of personal inspection, quality was checked mostly by looking at and touching the produce. One-third of the retailers reported that they even taste the produce. While only part of the produce could be checked in most transactions, almost all retailers believed that the checked sample was representative.

While modern markets, and especially international markets, put a high premium on food safety, this seems to be less the case in these traditional horticultural markets. The use of modern inputs is high in horticultural production in India, but the current marketing system does not allow for transmission of information on the use of inputs (Fafchamps, Vargas Hill, and Minten 2008), even if there might be important public health issues related to lack of proper attention and effective food safety standards (Umali-Deininger and Sur 2007).[13] In our sample, only one-fifth of the retailers stated that they were aware of the farmers' cropping practices and use of pesticide, fertilizer, and irrigation water. However, even if retailers are aware, this does not preclude the sale of unsafe food. Recent research in India shows that in traditional markets there is no price premium attached to these unobservable quality characteristics (Fafchamps, Vargas Hill, and Minten 2008).

Quantity Assessment

Most of the farmers and retailers—80 percent and 73 percent, respectively—say that they know the exact weight of the lot in the transaction because the produce they are selling or buying has been weighed in front of them (Table 4.1). Weighing methods are mostly old-fashioned, with only about one-third of the weighing transactions using an electronic scale. When lots are weighed, in many cases weights are

[12] Some of the time spent at the market might be used not toward transactions but more toward social interactions that might not be of direct use for the transactions.

[13] For example, Marshall *et al* (2003) tested fresh vegetables at different production sites and in the main wholesale market in Delhi. They found that 72 percent of the spinach samples exceeded the Indian maximum residue levels (MRL) and 100 percent exceeded the Codex MRL. Kumari *et al.* (2004) found that 26 percent of their samples of seasonal vegetables contained residues above the MRLs.

rounded to the nearest kilogram, a practice mentioned by 88 percent of the farmers and 86 percent of the retailers. The advantage from rounding off weights is in most cases toward the broker or the retailer.

Table 4.1-Quality and quantity assessments

		Quality		Quantity	
	Unit	Farmers	Retailers	Farmers	Retailers
Overall					
There are quality/quantity differences between lots					
A lot	%	1	3	1	3
A bit	%	93	92	94	90
None	%	6	5	5	6
It happens that farmer/retailer receives/delivers lower quality/quantity than paid for					
Regularly	%	0	0	0	0
Sometimes	%	25	68	19	62
Never	%	74	32	80	38
It happens that farmer/retailer receives/delivers higher quality/quantity than paid for					
Regularly	%	5	3	5	3
Sometimes	%	68	52	64	29
Never	%	27	45	31	58
Last transaction					
Retailer had enough information before transaction	% yes		83		78
Quality assessment last transaction					
The retailer checked quality himself	% yes		85		
If not,…					
… how was quality assured?					
No assurance of quality	%		66		
Assurance is based on trust of broker	%		34		
If yes, …					
… way of quality checking					
by looks	%		100		
by touch	%		62		
by smell	%		7		
by taste	%		34		
… retailer was able to check whole lot	% yes		34		
… if only part of the lot, was it representative?	% yes		90		
The retailer knows about production activities					
(for example pesticide use, irrigation water use)	% yes		22		
Quantity assessment last transaction					
Farmer/retailer knows exact weight of the lot	%			80	73
If weighed, …					
..., weighed in front of farmer/retailer?	%			80	93
type of scale used is					
… mechanical	%			67	73
… electronic	%			33	27
rounding off weights	%			88	86
rounding off weight to farmer's advantage	%			16	11
rounding off weight to retailer's advantage	%			84	89
If not weighed,…					
…, differences between standard units?					
A lot of variation	%			0	8
A bit of variation	%			88	83
No differences	%			12	8
Retailer knows quantity of wastage at purchase					
Exactly	%				9
Approximately	%				57
Not very well	%				34

Source: Authors' own survey.

The lots that are auctioned might contain waste, such as rotten produce or foreign matter. For the retailers to correctly valuate lots before making a bid, they should be well informed of the wastage levels. If not, retailers might charge uncertainty premiums that are passed through to the farmers. About one-third of the retailers state they do not know very well beforehand the level of wastage of the lot that they will purchase. A few, 9 percent, say that they do know it exactly, while most (57 percent) claim to know it approximately (Table 4.1).

Overall, the large majority (78 percent) of the retailers report being satisfied with the quantity assessment. However, there is still some dissatisfaction with the existing system as illustrated by the asymmetric responses by farmers and retailers about rewards and payments for quality and quantity. About two-thirds of the farmers believe that they sometimes deliver higher quality and quantity than they are paid for, while one-quarter or fewer believe that they deliver lower quality and quantity than they are paid for (Table 4.1). The complaints are similar, but in the opposite direction, for retailers.

Financial Settlement

Payments for the transactions are in most cases immediate and in cash for farmers as well as for retailers. Of the interviewed farmers, 82 percent state that they are paid within three hours after the transaction. The large majority of retailers also report paying immediately for the transaction. Agricultural trading is largely a cash economy, with almost none of the transactions settled by check or other more sophisticated means of payment. Similar results on the importance of unsophisticated and cash transactions have also been found in other developing agricultural economies (Fafchamps 2004; Fafchamps and Minten 1999; McMillan 2002).

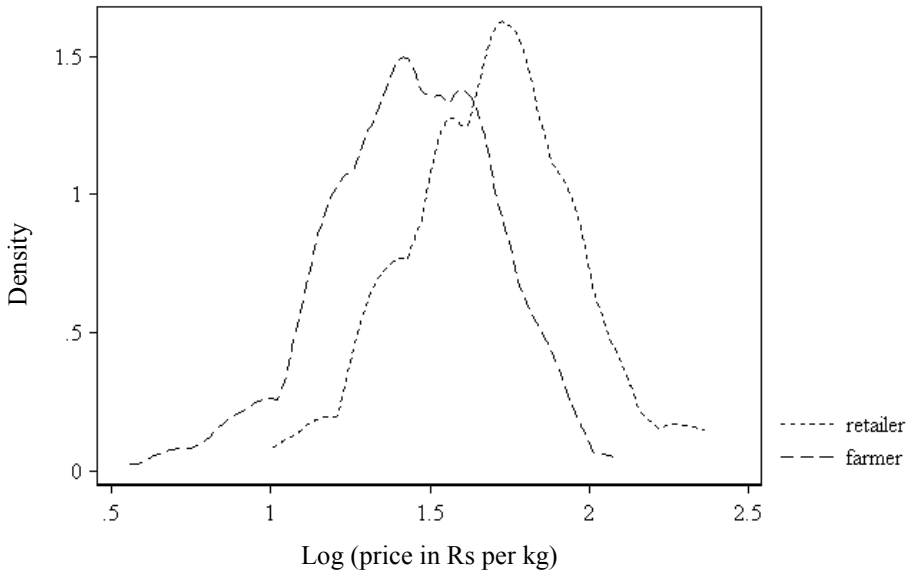
In summary, it seems that most transactions in these wholesale markets are small cash-and-carry transactions with significant transaction costs because physical handling, quality and quantity assessments, and financial settlements are all combined in a single transaction. Fafchamps and Minten (1999) argued that this is usually not an efficient way of conducting trade, given that search costs are significantly higher than they should be and large amounts of cash circulate in the countryside, creating problems of insecurity as well as of an inflation tax. Along the same lines, Reardon et al. (2003) argued that the separation of the different processes of physical handling, quality and quantity assessment, and financial settlement in developing countries' agricultural markets would often be essential to achieving greater efficiency through economy of scale.[14]

[14] For example, the large horticulture cooperative Safal has about 300 retail booths in New Delhi and a procurement system that has served as a model for different modern retailers in India. It organizes procurement through collection centers in the village, outsources transportation services, relies on farmers' associations to assess quality and quantity, and pays through bank wires.

5. THE EFFECT OF REGULATONS

An important regulation of the APM Act in vogue in Uttarakhand states that the broker rates should not be higher than 3 percent and that a 2.5 percent tax on each transaction is to be paid by the broker to the market officials. The act states that both these charges are *not* to be paid by the farmer. Using the data that were collected from farmers and retailers, we test to what extent these regulations are respected. Figures 5.1 and 5.2 show the net prices that farmers received and that retailers paid for the two products under study.[15] First, they illustrate the large price variation for these products over the time of the survey, often due to location, quality differences, and the day of the transaction. Second, they show the clear parallel leftward shift of the net price received by the farmer compared with the price paid by the retailer, reflecting the wholesale market costs and rents.

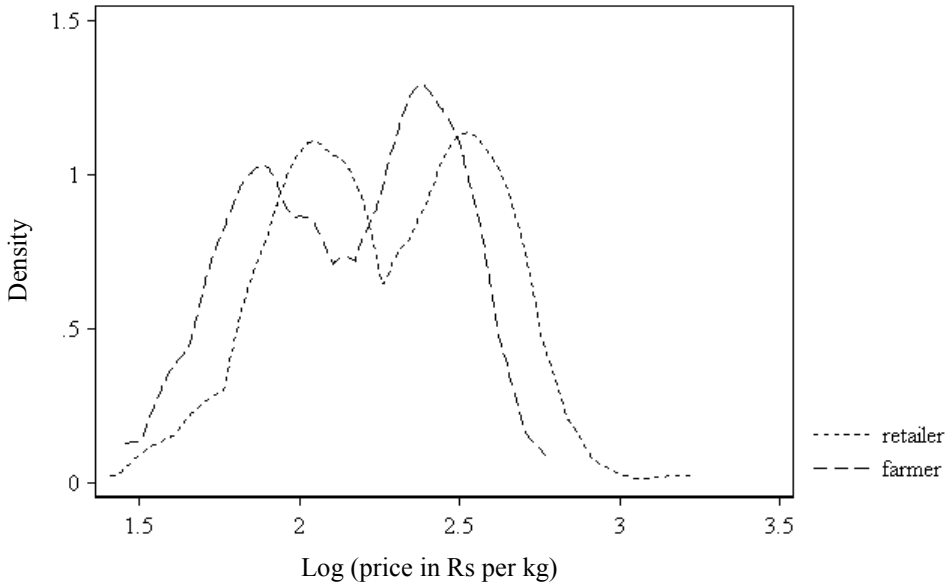
Figure 5.1—Cauliflower prices



Source: Authors' own survey.

[15] Small business owners often overreport expenses and underreport revenues. We have tried to minimize this bias by surveying farmers and retailers right after their last transaction and by trying to be as specific as possible in formulating our questions. All this information was used to calculate net prices, defined as the total amount that farmers would take home and that the retailer would have paid after leaving the *mandi*. We have asked the exact volume transacted, the gross value (farmers could choose whether to specify this for total volume, per bag of produce, or per kilogram of produce), and all the costs faced (disaggregated) at the *mandi*. The transportation costs were asked for separately as a cost not faced at the *mandi* (and not integrated in the net price calculations). In the majority of cases, retailers did not face transportation costs, since they typically would come to the wholesale market with their own pushcart early in the morning, fill up the cart with merchandise, and then take it to the area where they would sell the produce. Enumerators were trained for several days to make sure that the concepts of *net* and *gross* were well understood and implemented.

Figure 5.2 – Green pea prices



Source: Authors' own survey.

These figures, of course, are merely suggestive. To get a more accurate estimate of these costs, we should control for several factors that might influence prices (*P*) faced by different agents (farmers versus retailers) in the market. To do so, we estimate two empirical models. First, we run a parsimonious specification:

$$\log(P) = \alpha_0 + \alpha_1 L + \alpha_2 A + \varepsilon, \quad (1)$$

where *L* is defined as the wholesale market location, *A* is a dummy taking the value 1 for retailers, and ε is the error term. Then in a second specification we add additional controls, such as quality characteristics of the product (Q_k) and the time of the sale (S_l):

$$\log(P) = \alpha_0 + \alpha_1 L + \alpha_2 A + \Sigma_{kk} \alpha_{3k} Q_k + \Sigma_l \alpha_{4l} S_l + \varepsilon \quad (2)$$

For both specifications, we test the hypothesis H_0: The size of the margin measured by $\alpha_2 > 5.5$. A rejection of this hypothesis would indicate that the marketing regulations are not respected. It is important to note that, due to the specific organization of transactions at the wholesale market, we were not able to establish exact matches between farmers and retailers for the same lot being transacted. However, because of our specific sample setup and the collection of relevant controls, we believe that the estimated regression model does capture the appropriate aggregate margin averaged over the period of our survey.

The results of the parsimonious regressions are shown in model 1 of Table 5.1. They indicate that the (net) price paid by retailers is significantly higher than the (net) price received by farmers for both cauliflower and green peas. The difference is as high as 13 percent in the case of green peas and 26 percent in the case of cauliflower. Because the price differences could be caused by other factors, such as the quality of the product and the day of the transaction, we next add these additional controls in the second specification of the regression (Table 5.1, model 2). The coefficients stay largely significant and the size of the coefficient is robust.

The estimated price gap between farmers and retailers is significantly higher (as confirmed by the F-statistic reported at the bottom of Table 5.1) than the 5.5 percent (3 percent commission rate plus 2.5 percent tax) that one would expect it to be if the wholesale market worked as prescribed by the

regulations. Since we interviewed only farmers and retailers who had a transaction in the wholesale market, the results support the view that marketing regulations on margins are not respected.

The difference that we find even exceeds the gap that was predicted by key informant interviews. One of the key informants that we talked to at the Dehradun horticultural *mandi* claimed there is a general agreement among brokers of his union to charge 6 percent commission to sellers (farmers) and 6 percent to buyers (retailers), including *mandi* taxes. The corresponding agreement in Haldwani was to charge 8 percent commission to farmers. Such agreements were clearly in violation of APMC rules. We also interviewed several APMC officials to hear their side of the story. After some probing, APMC officials admitted that brokers were charging rates beyond legal limits and that brokers would underdeclare their effective turnover in order to avoid taxes. However, not much was apparently being done about this, perhaps because the lobby of brokers was said to have powerful connections with the government and because brokers were reported to fund electoral campaigns. Obviously, these latter statements are difficult to verify in practice.

Table 5.1—Determinants of vegetable prices

Dependent variable =		Cauliflower						Green peas					
Log(price per kg)		Model 1			Model 2			Model 1			Model 2		
	Unit	Coeff		t-value	Coeff		t-value	Coeff		t-value	Coeff		t-value
Retailer	1 = yes	0.26	***	9.23	0.24	***	8.41	0.13	***	4.12	0.13	***	4.40
Dehradun market	1 = yes	0.28	***	9.91	0.31	***	8.26	-0.41	***	-13.10	-0.47	***	-15.11
Medium size	1 = yes				-0.13	***	-3.77						
Small size	1 = yes				-0.27	***	-4.35						
Mixed size	1 = yes				-0.12	**	-2.79						
Number of peas per shell	number										-0.02		-2.08
Presence of spots	1 = yes				0.07	*	1.97				-0.02		-0.47
Rotten material	1 = yes				0.05		1.34				-0.13	***	-2.75
Dull color	1 = yes				0.03		0.68				-0.10	**	-2.50
Day of transaction included		NO			YES			NO			YES		
Intercept		1.30	***	53.31	1.71	***	15.78	2.35	***	109.27	2.51	***	24.79
Number of observations		240			239			240			236		
F-statistic		92.40			18.86			87.85			69.66		
Prob > F		0.00			0.00			0.00			0.00		
R-square		0.44			0.61			0.44			0.62		
F-test for price difference between farmer and retailer higher than prescribed 5.5%													
F-value		53.37	***		42.43	***		5.48	**		6.29	**	
Prob. > F		0.00			0.00			0.02			0.01		

Source: Authors' own survey.

Note: Significance level is expressed as *** for $p < 0.01$, ** for $p < 0.05$ and * for $p < 0.1$.

6. RELATIONSHIPS WITH BROKERS AND MARKET INTERLINKAGES

Types of Relationships with Brokers

While there are only a few marketing options for the surveyed farmers and retailers outside the broker channel (partly due to market regulations), there seems to be a large set of options within this channel. Farmers state they can choose from among 60 brokers dealing in the produce they are selling. Of these brokers, they say they know 5 personally. In practice, however, farmers use only a limited number of brokers for their transactions—fewer than 2 on average (Table 6.1). In the past year, 57 percent of the farmers used a single broker for all their transactions in a particular product (on average 26 transactions in total). A significant number of farmers thus self-select into a specific broker relationship. Often they have a long-term relationship with this broker, having dealt with the broker of the last transaction, on average, for almost 10 years.[16] This suggests that traditional Indian wholesale markets have not yet moved from the traditional type of market exchange, which is personalized and relationship based, to the modern type, which is rules based and anonymous (North 1990, 83).

Table 6.1—Frequencies of transactions and reasons for the choice of a broker

	Unit	Farmers		Retailers	
		Avg or %	St. Dev.	Avg or %	St. Dev.
Frequency of transactions					
Number of transactions through brokers					
this season	number	9.6	9.7		
last year	number	26.1	27.2		
last two weeks	number			9.0	2.7
Number of brokers used for these transactions					
this season	number	1.6	0.9		
last year	number	1.8	1.2		
last two weeks	number			3.5	2.6
Number of brokers used last season (farmers)/last 2 weeks (retailers)					
one	%	57		17	
two	%	33		19	
more than two	%	10		64	
Time dealt with the broker of last transaction	years	9.7	9.1	9.2	7.1
Percent that states this a "very important" reason for choosing the broker in the last transaction					
"He finds lots of potential buyers/sellers"	%	46		34	
"He offers better prices"	%	55		64	
"He offers higher quality"	%			66	
"He gives seasonal input advances"	%	26			
"He allows me to defer payment"	%			16	
"He offers loans in case of need"	%	21		4	
"I have the habit"	%	50		29	
"He has quick transactions"	%	63		58	

Source: Authors' own survey.

An obvious question, then, is why these farmers self-select into long-term relationships. Different reasons have been given in the literature, related to the benefits of "cooperative relationships" in this type of trading environment (for example, Kranton 1996; Fafchamps and Minten 1999, 2002). They include, among others, information sharing, regularity of supply and demand, access to credit, prevention of contractual breach, and risk sharing.

[16] Retailers report a similar large number of brokers to choose from, but they effectively use a larger number of them for transactions than farmers use.

In earlier (for example, Bell 1990) as well as more recent (for example, Reardon, Gulati, and Minten 2008) literature on Indian agricultural markets, it has been suggested that financial interlinkages between farmers and brokers in traditional markets have been a major reason for the resilience of traditional markets and the perceived difficulty modern channels have in competing with traditional ones. In this literature, it is argued that long-term relationships with brokers are especially valuable for access to credit and insurance.

Access to seasonal credit is often problematic for the poorest farmers all over the developing world, mostly due to seasonal liquidity constraints (Dercon and Christiaensen 2007). Furthermore, a common problem for rural agricultural economies is the prevalence of different types of shocks, for which poorer households might be especially ill prepared. Given the lack of formal insurance mechanisms, households must often rely on social capital and the sale of assets to deal with shocks, and only those households that have access to informal insurance mechanisms are able to successfully smooth their consumption (see, for example, Rosenzweig and Wolpin 1993). Hence, if there are important imperfections in rural credit and insurance markets, the opportunity to establish market interlinkages seems to be a plausible reason for entering into personal relationships with brokers, since doing so gives farmers (and possibly petty retailers) access to informal credit and insurance markets.

While there is ample evidence in the academic literature on the existence of these interlinkages (Hoff and Stiglitz 1990; Bell, Srinivasan, and Udry 1997), it is less clear which role they play in the establishment of long-term relationships with brokers. This is one subject we will document in this section. Moreover, there has been a lot of interest in the literature about the nature of these interlinkages. In particular, it has often been argued that such interlinkage might lead to exploitation of farmers (for example, by Crow and Murshid 1994; Basu 1986; Bell 1988).[17] To complement the existing literature, which mostly focuses on interlinkages between farmers and brokers, we also investigate whether there are similar links between petty retailers and brokers.

Our data show that some farmers—and a limited number of retailers—indeed use the broker as a source of credit, insurance, or both (Table 6.2). In case of need, 39 percent of the farmers report, the broker would grant them a loan "for sure"; 18 percent of the farmers think the broker would "probably" do so. While more than half of the farmers think they could rely on the broker in case of need, only 22 percent of them have ever received a loan from the broker they dealt with in the last transaction. In the last 5 years, 20 percent of the farmers received a loan.[18] However, farmers seldom rely exclusively on brokers for access to credit; 96 percent report having alternative sources of credit. These include formal banks (for 46 percent of the farmers) but more importantly friends and family (78 percent). In addition, this year 21 percent of the farmers received an input advance from the broker they dealt with in the last transaction. For half of the farmers this advance was in kind, specifically in the form of seeds.[19] Hence, it seems that interlinkages are prevalent in these agricultural markets, and even if a minority of farmers are effectively using them for access to credit, insurance, or both, many more report they could use them if they wanted .[20]

[17] However, this does not have to be the case, and the interlinkages can even be beneficial, as shown on other continents and in other settings by Dries and Swinnen (2004); Gow and Swinnen (2001); Minten, Randrianarison, and Swinnen (2009); and Maertens and Swinnen (2009).

[18] The average value of the loan was INR 8,263 (more than $200), or about two to four times the value of the last transaction.

[19] No fertilizer or pesticides were given in kind to any farmer in our sample. A few farmers received advances, partly in cash and partly in kind.

[20] This has also been found by other authors. For example, Bell reports that "Traders and commission agents (who operate as brokers between farmers and both private traders and state purchasing agencies) are often heavily involved in financing cultivation, with the provision that their clients sell their crops to or through them, respectively" (1990, 306).

Table 6.2—Credit and input advances

	Unit	Farmers		Retailers	
		Avg or %	St. Dev.	Avg or %	St. Dev.
Access to credit/insurance					
Number of brokers that farmer/retailer could obtain a loan from	Number	1.1	1.1	0.6	1.2
Broker used in last transaction					
The broker would give a loan in case of need					
yes, for sure	%	39		7	
probably	%	18		22	
no	%	44		71	
Buyer/seller ever received a loan from this broker	%	22		2	
Number of loans received in the last five years[1]	number	1.9	1.1	2.4	1.7
Value of loan - mean	INR	8,263	9,429	21,500	38,464
Buyer/seller has other sources of loans	% yes	96		95	
If yes, from…					
...bank	%	46		17	
…friends/family	%	78		81	
…others	%	2		14	
Access to input advances (from broker in last transaction)					
Received an input advance this season from broker in last transaction	%	21			
(Partly) in kind (seeds)	%	12			
Value of seeds received - mean	INR	6,115	7,769		
(Partly) in cash					
Amount of cash received - mean	INR	6,982	9,546		
Had to pay interest on these advances	% yes	4			
Receives advances every year	% yes	6			
What would happen if these input advances were not paid back?[2]					
"Broker would not work with me anymore"	% yes	84			
"Broker would complain to the market authorities"	% yes	20			
"Broker would complain to the other brokers"	% yes	77			
"Broker would use social pressure in the village"	% yes	55			
"Broker would bring me to the police or court"	% yes	2			

Source: Authors' own survey.

Notes: [1] For those who ever received a loan; [2] For those who ever received input advances.

Interestingly, access to credit through brokers is practically insignificant for retailers. Only 7 percent of the retailers believe that the broker would give a loan "for sure" in case of need, and only 2 percent of the retailers report ever having received a loan from a broker. Moreover, 95 percent of the retailers claim to have other options for access to credit. Nevertheless, retailers also typically self-select into long-term relationships with brokers, and they do so nearly as much as farmers: Retailers on average report having transacted with the same broker for 9.2 years (compared with 9.7 years for farmers). While they typically interact with a larger number of brokers than farmers do (on average 3.5 in the last two weeks), this could be because brokers specialize in certain products, whereas most retailers have a large variety of products on offer.

Interlinkages notwithstanding, when farmers and retailers are explicitly asked why they chose the specific broker in their last transaction, surprisingly few respondents list these financial services as a major reason. In practice, access to credit and insurance lag behind all other options given (Table 6.1). Only 26 percent of the farmers list the provision of input advances and 21 percent list the provision of loans for other purposes as an important reason for selecting a broker. Our earlier finding on the insignificance of interlinking for retailers is once again confirmed: Only 4 percent of the retailers chose the particular broker because of the financial services he provides. Overall, it seems interlinkages are less important in explaining repeated exchange and personalized relationships than has been assumed in the literature.

Sharing information also does not perform well in explaining long-term relationships with brokers. Wholesale horticultural transactions are spot transactions, where farmers and retailers show up without much prior contact. Of the farmers and retailers, respectively, 95 percent and 98 percent reported that they had no contact with the broker before coming to the market. For those who had contact, only a limited number discussed prices with the broker. Most of the price information, for both farmers and retailers, was obtained informally through personal observation or through contacts with fellow farmers or retailers.

While a seemingly noneconomic reason such as habit formation is part of the explanation of going through a specific broker (50 percent of farmers and 29 percent of retailers state this to be very important), most farmers and retailers state that the decision is mostly based on a perceived reduction of search costs and on obtaining the best price possible. This is in line with the argument made by Fafchamps (2004) that repeated exchange can be seen as a way of economizing on the costs of establishing personal trust and with anecdotal evidence from our survey that "new" farmers were charged higher commission rates. The importance of trust in the relationship between farmers and brokers is also reflected in the trust-related results coming out of our data. While only 52 percent of farmers report trusting most *mandi* officials, up to 95 percent of the farmers in our sample report trusting most brokers. This corresponds to 49 percent and 95 percent for retailers, respectively.

The Nature of Interlinkages

Next, we turn to a more detailed description of the nature of interlinkages observed at the wholesale markets under study. There is a vast literature on interlinking markets. Seminal work by Bell (1988) and Basu (1986) indicates that a principal can extract more profit by interlinking certain markets. Typically, credit markets are interlinked with land, labor, output, or input markets. Below-market interest rates lead to higher productivity and hence higher gains in the linked markets—be it the land, the labor, the output, or the input market—where above-market rates can be charged by the lender or below-market rates paid to the borrower. However, as discussed earlier, it has also been argued that such interlinkage might lead to exploitation of farmers (for example, by Crow and Murshid 1994; Rao and Jeromi 2006).

In a different strand of literature, Bardhan, Mookherjee, and Tsumagari (2009) argue that intermediary traders play crucial roles in marketing and financing activities all over the developing world, and that this constitutes a source of rent creation. In their view, these *entrepreneurial rents* are a result of the traders' access to cheaper credit (or in our context possibly also better inputs) in a world with credit market imperfections, as well as a result of reputational advantages they may enjoy vis-à-vis other traders.

To corroborate these arguments, we explore different aspects of these interlinkages coming out of our data. First, we analyze the determinants of market linkages. Knowledge of who is more likely to use these financial services (and to what extent) may already give us some insights in their potentially exploitative nature. In particular, rent extraction would be more likely to occur in the case of bargaining power imbalances between the farmer and the broker. Viewed from this perspective, if poor farmers (who can be assumed to be more vulnerable) are disproportionately involved in interlinkages, this may be a reason for concern.[21] Next, we verify whether interlinkages result in high interest rates on advances as well as in below-market output prices.

[21] Since the credit use variable is a function of factors that determine both the willingness of the broker to supply credit and the demand for credit by the farmer, there is no clear argument on how poverty levels would influence credit use, and the sign of its coefficient could go either way. For example, poor farmers may ask for more (or more frequent) credit because they are more capital constrained, whereas rich farmers may ask for more (or more frequent) credit because they generally use more capital-intensive cultivation methods. On the supply side, rich farmers may be offered more (or more frequent) credit because they have better capacity to repay or to give a more assured return on investment, whereas poor farmers may be offered more (or more frequent) credit if they are seen as an easy target for rent extraction (which is the result that would alarm us). For a detailed discussion of credit use and the poor in developing countries, see, for example, Zeller and Sharma (1998).

Determinants of Interlinkages

To empirically explore what the determinants are that drive access to credit and input advances from brokers to farmers, we use a Heckman model, whereby we estimate in the first stage the likelihood that a farmer was a beneficiary of a loan for personal needs in the last five years and of input advances in the last season, and then estimate in the second stage how much he received. The distance from the farmer to the wholesale market serves as an instrument in the selection equation.[22] The results are shown in Table 6.3.

The selection into interlinked credit relations is seemingly little associated with poverty levels, since poorer farmers have the same access to loans as richer ones (as measured by total land cultivated, by having access to a BPL card, or by being a member of an SC/ST/OBC). Farmers who live further from the market are significantly less likely to receive a loan (or input advance). Using the distance to markets as instrument, the selection bias is reported to be insignificant by the likelihood ratio (LR) test, shown at the bottom of Table 6.3. This means that we may also consider the ordinary least squares (OLS) estimation of the determinants of the size of the loans or input advances as valid (and moreover preferred to the second-stage Heckman regression results, since the OLS estimation is more efficient). The OLS results are thus also presented in Table 6.3.

Farmers who devote more land to the vegetable under study receive significantly larger loans. A doubling of the area increases the size of a loan for personal needs as well as the size of input advance by around 50 percent. This confirms earlier results of Bell and Srinivasan (1989), who found credit–marketing linkages in India to be stronger in the states where larger farmers dominate.[23]

These findings seem to indicate that brokers provide financial services in a rational way and that they do not discriminate in favor of or against the poor or specific castes. Brokers are more likely to provide loans or advances to those farmers who are easier to monitor (as measured by travel time from the farmer's village to the market), and they are more likely to provide larger loans or advances to farmers who have a larger trade volume on which the broker can earn his margin (as measured by the area allocated to the crop traded).

[22] Distance to the wholesale market should be a determinant of the cost of recouping the money in case of default, but conditional on receiving a loan, it can be argued that it should not affect the amount of the loan.

[23] Crow and Murshid (1994) found in Bangladesh that social power is an important determinant of access to loans and that poorer households get loans but on less advantageous conditions.

Table 6.3—Determinants of loans and input advances received by farmers

		Log(inputs)						Log(loans)					
		OLS			Heckman			OLS			Heckman		
		Coeff		t-value	Coeff		t-value	Coeff		t-value	Coeff		t-value
Determinants of log(Amount in INR)													
household characteristics													
Member of SC/ST/OBC	Yes = 1	-0.13		-0.31	-0.17		-0.46	-0.66	*	-1.69	-0.53		-1.10
Years of education	Log(number)	-0.07		-0.49	-0.15		-0.88	-0.13		-0.44	-0.30		-0.71
Holder of BPL card	Yes = 1	0.22		0.72	0.22		0.73	0.33		1.08	0.32		1.03
Household size	Yes = 1	-0.07	**	-2.33	-0.06		-1.75	0.02		0.30	0.01		0.19
Production characteristics													
Cauliflower	Yes = 1	-0.18		-0.17	-0.52		-0.37	-1.07		-0.91	-0.73		-0.55
Area cultivated in cauliflower	Log(area)	0.26		0.73	0.31		0.81	0.82	**	2.39	0.75	*	2.09
Area cultivated in green peas	Log(area)	0.50	**	2.04	0.46	*	1.58	0.55	**	2.53	0.57	**	2.79
Market characteristics													
Market of Dehradun	Yes = 1	0.60	*	1.64	0.63		1.52	-0.08		-0.18	0.04		0.08
Intercept		8.02	***	15.37	7.58	***	6.83	7.94	***	7.62	8.68	***	5.42
Selection equation													
Household characteristics													
Member of SC/ST/OBC	Yes = 1				0.00		-0.01				-0.15		-0.56
Years of education	Log(number)				-0.03		-0.25				0.55	***	3.23
Holder of BPL card	Log(number)				0.34		1.35				0.32		1.24
Household size	Yes = 1				0.03		0.94				0.03		0.78
Production characteristics													
Cauliflower	Yes = 1				-0.71		-1.16				-0.83		-1.29
Area cultivated in cauliflower	Log(area)				0.21		1.04				0.23		1.13
Area cultivated in green peas	Log(area)				0.02		0.13				-0.01		-0.06
Market characteristics													
Market of Dehradun	Yes = 1				0.04		0.15				-0.40		-1.57
Distance to the market	Log(hours+1)				-0.80	***	-2.73				-0.53	**	-1.83
Number of visits per year	Log(number)				0.16		1.10				-0.15		-0.88
Intercept					0.20		0.30				-0.46		-0.62
No of observations		47			237			52			237		
R-squared		0.39						0.28					
Wald $chi^2(8)$					30.59						25.67		
Prob > chi^2					0.00						0.00		
LR test of independent equations													
(rho = 0)				$Chi^2(1)$	0.29					$Chi^2(1)$	0.39		
				P-value	0.59					P-value	0.53		

Source: Authors' own survey.

Notes : Regression results robust to heteroskedasticity. Significance level is expressed as *** for $p < 0.01$, ** for $p < 0.05$ and * for $p < 0.1$.

Interest Rates

As shown in Table 6.2, usually no interest is charged on interlinked input advances. While 11 percent of the surveyed farmers received input advances, less than one in five is charged interest on the advance.[24] Hence, in line with the traditional literature on interlinking (Bell 1988; Basu 1986), brokers do seem to subsidize capital costs for farmers.

Output Prices

With our data, we do not find evidence of exploitative interlinkages as reported in other settings. While advances have to be paid back from sales revenues, interlinkage does not seem to lead to lower implicit product prices. To empirically test this hypothesis, we link the product prices with a dummy on the use of input advances or loans for personal needs in the last five years. We run an OLS regression, in which we control for the type of product and the quantity transacted, the day and location of trade, a range of observable quality attributes of the product, and a set of household characteristics that could possibly also play a role in price determination (for example through bargaining power). Further, given potential endogeneity concerns, we also run (1) a two-stage least squares (2SLS) instrumental variable (IV) regression, wherein we instrument the use of credit or input advances by the logarithm of the time needed for the farmer to travel to the market, and (2) a treatment effects regression (treatreg), wherein we use travel time to the market, product type, market location, and some household characteristics to predict treatment (Table 6.4).

The first-stage regression of the IV estimation shows, as expected, that a further physical distance from the market is associated with lower use of credit or input advances. The value of the F-test is significant at the 10 percent level but is below 10, indicating a problem of weak instruments. Given the presence of weak instruments, we apply the Anderson–Rubin test (Mikusheva and Poi 2006). This procedure corrects the threshold value for the significance of the variable of interest, allowing for weak instruments (bottom of Table 6.4).

Table 6.4—Effect of interlinkage on prices paid to farmers

Dependent variable =		OLS			IV			Treatreg		
Log(price per kg)	Unit	Coeff		t-value	Coeff		t-value	Coeff		t-value
Credit/input advances	yes = 1	0.09	***	2.75	0.55		1.54	0.42	***	2.67
Cauliflower	yes = 1	-1.41	***	-5.73	-1.60	***	-3.79	-1.28	***	-5.09
Dehradun market	yes = 1	-0.14	***	-2.89	-0.14	**	-2.06	-0.14	**	-2.48
Cauliflower										
Quantity sold	log(kg)	0.02		0.77	0.05		1.02	0.02		0.79
Medium size	yes = 1	0.05		0.88	0.10		1.12	0.01		0.22
Small size	yes = 1	-0.12		-1.10	-0.14		-1.04	-0.16		-1.43
Mixed size	yes = 1	-0.14	*	-1.80	-0.16	*	-1.78	-0.20	**	-2.54
Presence of spots	yes = 1	0.20	***	2.75	0.13		1.37	0.18	***	2.71
Rotten material	yes = 1	0.04		0.56	0.01		0.08	0.05		0.64
Dull color	yes = 1	0.21	**	2.40	0.23	**	2.54	0.19	**	1.96

[24] Unfortunately, the corresponding figures for practiced interest rates on loans are lacking; since input advances and loans are of similar sizes, one could possibly expect similar patterns for these. This is left for future research.

Table 6.4—Continued

Dependent variable =		OLS			IV			Treatreg		
log(price per kg)	Unit	Coeff		t-value	Coeff		t-value	Coeff		t-value
green peas										
quantity sold	log(kg)	-0.09	***	-2.79	-0.09	**	-2.20	-0.08	***	-2.81
number of peas per shell		-0.02		-1.27	0.00		0.00	-0.02		-1.25
presence of spots	yes = 1	0.07		1.25	-0.04		-0.29	0.07		1.27
rotten material	yes = 1	-0.20	**	-2.16	-0.19	*	-1.68	-0.20	**	-2.34
dull color	yes = 1	0.01		0.10	-0.21		-1.02	-0.01		-0.17
Household characteristics										
member of SC/ST/OBC	yes = 1	-0.09	**	-2.06	-0.06		-1.05	-0.09	*	-1.82
years of education	log(nr)	0.05	**	2.40	0.02		0.60	0.02		0.81
holder of BPL card	yes = 1	0.00		0.14	-0.03		-0.47	-0.02		-0.54
day of transaction included		yes			yes			yes		
intercept		3.21	***	16.31	3.00	***	7.90	3.12	***	15.70
Number of observations		239			237			237		
F(26, 212)		49.91			15.52					
Prob > F		0.00			0.00					
Wald $chi^2(26)$								1,026.17		
Prob > chi^2								0.000		
R-square		0.77			0.60					
Adj R-square					0.55					
AIC		-2.34						270.56		
BIC		91.53						395.41		
For IV regression:										
First-stage regression statistics					F(1,215)		3.750			
p-value for significance instrument: log(distance traveled)					Prob > F		0.054			
p-value Wu-Hausman F-test for exogeneity of end. var					Prob > F		0.086			
p-value Durbin-Wu-Hausman test for exogeneity of end. var.					Prob > Chi		0.069			
p-value A-R test for signif. end. var. with weak instrument (cov.-corr. conf. set)							0.042			
For treatment effects (ML) regression:										
p-value Wald-test of independent equations					Prob > Chi		0.004			

Source: Authors' own survey.

Notes : The selection equation of the treatment regression controls for logarithm of time required to travel to market (which functions as the excluded instrument in the IV regression), for product and market, and for same household characteristics as above.

Results for regressions (1) and (3) are robust to heteroskedasticity. Results for regression (2) are robust to weak instruments. Significance level is expressed as *** for $p < 0.01$, ** for $p < 0.05$ and * for $p < 0.1$.

Controlling for endogeneity raises the coefficient on the endogenous variable, suggesting that our OLS estimation was underestimating the impact of receiving credit on producer prices. This could be caused, for example, by a feedback from product prices onto the demand for credit, in particular the fact that farmers who receive lower prices need credit more often.

All specifications (OLS, IV, and treatment regression) show there is no significant negative link between the use of credit and prices received by the farmer, implying that there is no evidence that interlinkage leads to lower prices for the farmer. In fact, the reverse even seems to be true: From the OLS

and the treatment regression it seems that market interlinkages coincide with better pricing conditions for farmers. The endogenous variable carries the same sign in the IV regression, but it is not significant due to the lower level of efficiency in the latter. A potential explanation rests in the fact that credit could be a proxy for trust or loyalty, which may have a positive impact on prices as well. If this is true, provision of financial services could be interpreted as a strategy for nonprice competition, rather than an instrument for exploitation.

Brokers thus seem to use these interlinkages to tie farmers to them and increase their turnover. They seem to have enough rents under the existing regulated market system to pay for the cost of the financial services they provide. These rents may arise from market regulations that lead to restricted trader entry and pervasive collusion (see, for example, Goyal 2010), or from advantages these brokers enjoy in terms of access to credit and input markets—in line with the argument made by Bardhan, Mookherjee, and Tsumagari (2009).[25] Another possible source of broker rents reported by Goyal (2010) is the informational advantage on market and price conditions brokers enjoy as compared with the sellers and buyers they interact with.

To better understand these interlinkages, we further asked farmers what the broker would do if the farmer did not pay back the loan received. As is usually the case in this type of market, a formal enforcement mechanism is little relied upon (see, for example, Fafchamps and Minten 2002; McMillan and Woodruff 1999; Gow and Swinnen 2001). Farmers report that it is very unlikely that the broker would go to the market authorities, to the police, or to court (see Table 6.2). However, the broker would refuse to work with the defaulting farmer in the future, might inform other brokers about the default, and might use peer pressure in the village to enforce repayment.

[25] Almost half of the farmers in our survey who received input advances in the form of seeds reported that they would not be able to find the same quality of seeds themselves at the same price. On the other hand, they do not believe that productivity of their vegetables was higher because of the use of these inputs.

7. CONCLUSIONS AND IMPLICATIONS

Relying on primary microlevel data, we study the wholesale market activities of agricultural brokers in India. Our results show that market regulations are significantly different from effective practices in the wholesale markets under study. For example, most brokers charge rates that significantly exceed the prescribed ones. This is an important finding to feed into the ongoing debate on the importance of existing market regulations, which seem to impede the development of modern market channels. For example, regulations in many states prohibit direct purchases from the farmer outside the regulated market system, and there are severe restrictions on foreign direct investment in modern retail.

Further, since brokers seem to be able to capture rents under current market regulations, it can be expected that removing these regulations to allow for free entry into primary marketing of agricultural produce would offer scope to increase competition and consequently raise both farm prices and incentives for increased productivity. One recent example of how increased competition in these settings can raise farm prices is the case of soybean prices in Madhya Pradesh, which significantly increased after the introduction of Internet-based kiosks that provide farmers with price information and an alternative marketing channel (Goyal 2010).

One often-heard critique of market deregulation is that it may lead to market power. However, it seems that given options and information, and given the often large number of players in food markets in Asia, the likelihood that monopsonistic or oligopolistic market structures might arise seems to be rather low in these markets. For example, a number of studies have shown the competitive nature of agricultural markets in Asia when they are unregulated (for example, Chowdhury and Haggblade 2000; Wang et al. 2009; Barker, Herdt, and Rose 1985; Hayami, Kikuchi, and Marciano 1999). In developed countries, companies in the food sector tend to undergo a certain degree of consolidation and concentration, often for efficiency reasons, which might lead to market structure concerns. However, it seems that India still has a long way to go to reach that stage. Moreover, there is a lack of convincing empirical evidence to support the argument that this would really hurt suppliers of agricultural products (see, for example, Swinnen and Vandeplas 2010).

Our results also show that some brokers tie farmers to them through linkages in credit and insurance markets. We find, consistent with previous literature on interlinkages (Bell 1988; Basu 1986), that brokers subsidize interest rates on advances, but in contrast with this literature, we do not find that this leads to lower implicit output prices for farmers who use these financial services. Interlinkages seem to be not an instrument for farmer exploitation but rather a service offered by brokers to establish farmer loyalty and ensure future supplies. Brokers seem to have enough rents under the existing regulated market system—possibly because of their overcharging—to pay for the cost of the financial services they provide.

It is interesting to find these linkages in traditional markets, since they seem congruent with the tendency toward the more vertical coordination in modern supply chains that will be necessary once food safety and quality requirements become critical benchmarks. In modern supply chains, companies often contract with suppliers and provide inputs, possibly on credit, as to assure quality. However, it seems that in traditional markets the incentive for brokers to establish interlinkages with farmers is different; their objective seems to be tying farmers' output to themselves in order to increase their own turnover (Crow and Murshid 1994; Bell and Srinivasan 1989; Bell 1990), with little regard for ensuring food safety, monitoring production practices, distributing quality inputs, or extending improved technologies—practices that are typical for modern markets (Swinnen 2007).

This implies that for some farmers there could be both benefits and costs of agricultural market deregulation. While all would benefit from getting better prices, some may lose access to the benefits of interlinkages and of subsidized advances. If input advances were still given in a deregulated and more competitive environment, farmers who use them would have to pay their real costs, which would show up

as higher interest rates or lower implicit output prices.[26] However, it seems that only a minority of farmers would be affected by this situation (in our survey, just over 20 percent of the farmers reported having received loans or advances). The vast majority of farmers (almost 80 percent in our survey) would not be affected by loss of interlinkages and would only benefit from the positive price effects of market deregulation.

[26] The spillover effects of output market liberalization on reduced access to inputs was a major issue in the liberalization of agriculture in eastern Europe and the former Soviet Union (Rozelle and Swinnen 2004) as well as in some African countries (Swinnen, Vandeplas, and Maertens 2011).

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